10 CFR 50.73

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102-06816-DCM/DJH
January 31, 2014

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS) Unit 2**
Docket No. STN 50-529 / License No. NPF 51
Licensee Event Report 2013-002-00

Enclosed please find Licensee Event Report (LER) 50-529/2013-002-00 that has been prepared and submitted pursuant to 10 CFR 50.73. This LER reports an automatic actuation of the PVNGS Unit 2 reactor protection system due to an electrical protection trip of the circuit breaker for the 1A reactor coolant pump motor.

In accordance with 10 CFR 50.4, copies of this LER are being forwarded to the Nuclear Regulatory Commission (NRC) Regional Office, NRC Region IV, and the Senior Resident Inspector.

Arizona Public Service Company makes no commitments in this letter. If you have questions regarding this submittal, please contact Mark McGhee, Department Leader, Regulatory Affairs at (623) 393-4972.

Sincerely,

D.C. Mims

DCM/DJH/hsc

Enclosure

cc:

M. L. Dapas	NRC Region IV Regional Administrator
J. K. Rankin	NRC NRR Project Manager PVNGS
A. E. George	NRC NRR Project Manager
M. A. Brown	NRC Senior Resident Inspector PVNGS

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NRR

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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4. TITLE

Automatic Actuation of Unit 2 Reactor Protection System Resulting from Reactor Coolant Pump Motor Trip

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
12	02	2013	2013	- 002 -	00	01	31	2014	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE

1

10. POWER LEVEL

100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☐ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☒ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Mark McGhee, Department Leader Nuclear Regulatory Affairs	623-393-4972

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	AB	MO	S188	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines*

On December 2, 2013, Unit 2 was operating in Mode 1 at 100 percent power. At approximately 1758 Mountain Standard Time a reactor trip was automatically actuated when reactor coolant pump (RCP) 1A speed dropped below 95 percent of rated speed which generated low departure from nucleate boiling ratio and high local power density trips on all four channels of the plant protection system. The reactor trip was determined to be uncomplicated and the reactor trip procedure was implemented to stabilize the plant in Mode 3. Operations personnel subsequently determined the RCP 1A motor circuit breaker tripped on excessive phase differential current.

The probable cause of the RCP 1A motor circuit breaker trip was a high impedance fault within the C phase of the motor stator coil. The faulted RCP 1A motor was replaced with an on-site spare RCP motor and Unit 2 was returned to power operation on December 14, 2013. The faulted motor has been sent to an off-site facility for disassembly and root cause analysis.

No previous similar events involving an automatic RPS actuation due to a RCP motor failure have been reported to the NRC by PVNGS in the prior three years.

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NARRATIVE

All times are Mountain Standard Time and approximate unless otherwise indicated.

1. REPORTING REQUIREMENT(S):

This Licensee Event Report is being submitted pursuant to 10 CFR 50.73 (a)(2)(iv)(A) to report an automatic actuation of the Palo Verde Nuclear Generating Station (PVNGS) Unit 2 reactor protection system (RPS) (EIIS: JC) due to an electrical protection trip of the circuit breaker for the 1A reactor coolant pump (RCP) (EIIS: AB) motor.

This event was reported to the NRC pursuant to 10 CFR 50.72 (b)(2)(iv)(B) at 2126 on December 02, 2013, via the event notification system (EN # 49600).

2. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):

The reactor coolant system (RCS) (EIIS: AB) is comprised of two main flow loops each of which includes two RCPs and one steam generator (EIIS: AB). The primary function of the RCPs is to provide the necessary head to maintain forced circulation of reactor coolant through the RCS during normal operations. Critical operation of the reactor requires all four RCPs to be in operation to ensure adequate RCS flow.

Each RCP is driven by a 12,000 horsepower electric motor supplied from the non-class 13.8kV electric power distribution system. Each RCP motor circuit breaker is provided with electrical protection trip features which include protection relays for under voltage, overcurrent, phase current differential, and ground. The phase current differential relay is calibrated to operate when it senses an excessive current difference between any two of the three motor phases.

The RPS is an assemblage of sensors, calculators (including the core protection calculators (CPCs)), logic circuits, and supporting equipment that monitor nuclear steam supply system (EIIS: AB) parameters and ensure the reactor is rapidly and reliably shut down to protect the fuel and RCS pressure boundary and assist the engineered safety features systems in accident mitigation. A pump speed signal from each RCP is provided to each of the four CPCs to support calculation of RCS flow. If any RCP slows to less than 95 percent of rated speed, the CPC software will introduce significant mathematical penalty factors into the departure from nucleate boiling ratio (DNBR) and local power density (LPD) calculations that result in DNBR and LPD trip signals on each RPS channel. The RPS actuation then causes simultaneous trips of the reactor trip switchgear breakers (EIIS: AA) which de-energize the control element drive mechanisms so that all control element assemblies are released to insert and shutdown the reactor.

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3. INITIAL PLANT CONDITIONS:

On December 02, 2013, PVNGS Unit 2 was operating in Mode 1 (Power Operation) at 100 percent power and normal operating temperature and pressure. There were no structures, systems, or components out of service that contributed to the event.

4. EVENT DESCRIPTION:

At approximately 1758 on December 2, 2013, the PVNGS Unit 2 control room received alarms indicating an automatic RPS actuation due to low DNBR and high LPD trip signals from each of the four core protection calculators. No other RPS actuation signals or actuations of plant engineered safety features occurred and all control element assemblies fully inserted. Control room personnel entered the emergency operating procedures and performed the standard post trip actions. The reactor trip was determined to be uncomplicated and the reactor trip procedure was implemented to stabilize the plant in Mode 3. RCS forced circulation was maintained throughout the event as RCPs 1B, 2A, and 2B remained in operation.

PVNGS Unit 1 and Unit 3 were operating at 100 percent power at the time of the event and were not impacted by the Unit 2 reactor trip.

Inspection of the 1A RCP motor circuit breaker found the related electrical protection differential relay and "86 lockout" relay both tripped. Troubleshooting of the 1A RCP circuit breaker, cabling, and motor determined an electrical fault had occurred within the motor windings. A plant cooldown was initiated and Unit 2 was placed in Mode 5 to allow for replacement of the faulted RCP motor.

5. ASSESSMENT OF SAFETY CONSEQUENCES:

This event did not result in a challenge to the fission product barriers or result in the release of radioactive materials to the environment. There were no actual safety consequences as a result of this event and the event did not adversely affect the health and safety of the public.

The reactor protection system functioned as designed and initiated an automatic reactor trip that expeditiously placed the plant in a safe condition. Throughout the event all vital and non-vital electrical power sources remained energized and RCS forced circulation was maintained with RCPs 1B, 2A and 2B remaining in operation.

This event did not result in conditions more severe than the limiting loss of flow event contained in Chapter 15 of the PVNGS Updated Safety Analysis Report which is based on a sheared RCP shaft accompanied by a loss of off-site power that results in the loss of all RCS forced circulation. This was determined to be an uncomplicated reactor trip which

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results in a very small increase in calculated core damage frequency according to the guidance in Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis."

The condition did not result in a safety system functional failure as described in 10 CFR 50.73 (a)(2)(v).

6. CAUSE OF THE EVENT:

The direct cause of the event was an electrical protection trip of the RCP 1A motor circuit breaker that initiated CPC trip signals for low DNBR and high LPD when the RCP speed dropped below 95 percent of rated speed. The RCP 1A motor circuit breaker tripped as a result of excessive differential current between electrical phases of the motor.

The investigation determined the probable cause of the circuit breaker trip to be a high impedance fault within the C phase of the motor stator coil.

The faulted motor has been shipped to an offsite facility for dissassembly and further root cause analysis. If information is subsequently developed that significantly affects a reader's understanding or perception of this event, a supplement to this LER will be submitted.

7. CORRECTIVE ACTIONS:

To repair the 1A RCP, Unit 2 was cooled down to Mode 5 and the faulted 1A RCP motor was replaced with an on-site spare RCP motor. Following completion of appropriate retests Unit 2 was returned to full power operations.

8. PREVIOUS SIMILAR EVENTS:

No previous similar events involving an automatic RPS actuation due to a RCP motor failure have occurred at PVNGS.